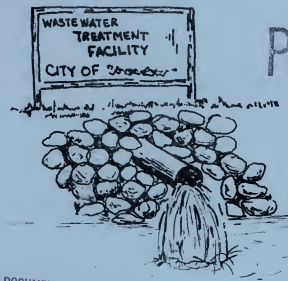
Big Sky Clearwater

Volume IX No. 2



SUMMER ISSUE 79

FORCE MAIN BREAK UNDER MISSOURI RIVER AT GREAT FALLS

On November 27, 1978, the City of Great Falls contacted the Water Quality Bureau indicating that there was no sewage flowing from the Sixth Street lift station to the wastewater treatment plant and approximately 5 mgd of raw sewage was being discharged to the Missouri River. Dye tests were run which indicated that the break was approximately 800 feet from shore (approximately at midstream). The City excavated the pipe on the north side of the river and removed some bolts from the joints. The bolts showed corrosion to the point that on some bolts less than one half of one thread was remaining in the nut. It was determined that the mechanical joints were probably the cause of the break and if the actual break was repaired, the force main would remain unsound and could rupture at a different location. However, the Water Quality Bureau ordered the City to continue their efforts in repairing the existing line while proceeding to make arrangements for permanent repairs of the line.

The efforts to forge the river and make repairs were curtailed after the bitter cold made the work impossible and a safety engineer determined that it would place undue risks on the workers involved to continue.

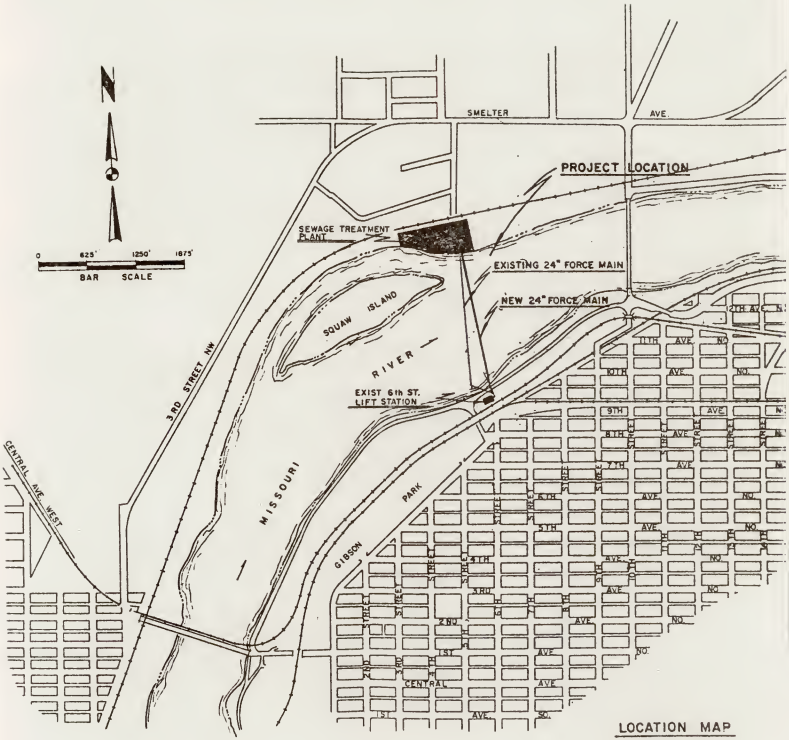
The City reviewed the options available to permanently fix the force main: 1) Replace all the bolts in the joints of the old line, 2) Replace old main with a new pipe under the river, 3) Replace the under-the-river crossing with an over-the-river crossing , and 4) Construction of a new force main crossing on one of the existing highway bridges. After comparing costs, environmental concerns and project completion time, it was determined that the best corrective measure was a new subsurface crossing at the existing location using special river crossing pipe with ball and socket joints. However, considerable time was needed to get the pipe and construction could not begin until the river was free of ice.

The City proceeded to order the pipe which had to be manufactured since the 24-inch pipe was not a shelf item with either of the two manufacturers in the U.S. The pipe was purchased from U.S. Pipe and Foundry and shipped via truck to Great Falls. The pipe began to arrive around the end of February.

On March 15 the City was authorized to award the construction contract to Willamette Western Corporation for the installation of the force main and construction proceeded. The construction work included trenching across the river, laying of the pipe and connection to the lift station and sewage treatment plant. The work went without any real problems. The construction company joined and pulled approximately 1600 feet of the 24-inch force main pipe across the river in approximately 7 hours.

The force main was pressure tested and placed on line on May 2 at which time the raw sewage discharge was eliminated.

In all, raw sewage was discharged to the river for approximately 150 days. The costs of the repairs was approximately $564,000 of which $423,000 was paid for by an EPA construction grant.



FORCE MAIN BREAK UNDER MISSOURI RIVER AT GREAT FALLS

M & I STUDY HELENA TREATMENT PLANT
By Kerwin Rakness

A biological treatment process can generally be classified as either suspended growth, like activated sludge, or attached growth, like tickling filters. In recent years, a modification of each of these two classifications of processes has been developed called the Activated Bio-Filter (ABF) wastewater treatment process. The ABF process is marketed by Neptune Microfloc, Inc. for use in secondary treatment and nitrification applications. The subject of this research effort is the ABF process used as a secondary treatment process.

The ABF process consists of a bio-cell unit and a short-term aeration unit. The bio-cell unit is comprised of redwood media stacked in a tower over which the wastewater is distributed. This unit has properties of the attached growth classification of biological treatment processes. However, one modification to conventional attached growth systems is that for the ABF system, sludge from the secondary clarifiers is returned to the bio-cell to mix with the incoming wastewater resulting in a mixed liquor that is distributed over the redwood tower. Originally, the bio-cell unit with "mixed liquor" distribution was the only unit of the ABF process. Later, a modification to the ABF process design was made by the manufacturer which provided short-term aeration of the mixed liquor after the bio-cell and before clarification. The aeration of mixed liquor is an extension of the suspended growth biological treatment property of the ABF system, thus the ABF process has a combination of attached growth and suspended growth properties.

Many ABF systems are being considered for new plant design and existing plant upgrades throughout the United States. However, limited full-scale performance information is available for this new process for systems operating at design loading conditions. The manufacturer's current design recommendations for the bio-cell and short-term aeration unit sizes are based primarily upon pilot plant operating results, coupled with appropriate process theory considerations. Because of the potential large-scale use of ABF systems as a treatment alternative, data from a full-scale ABF treatment process has been the subject of increasing interest among consulting engineers, municipal and state officials, and EPA research and construction grant personnel. Of prime importance is performance information at the manufacturer's current recommended design loading conditions.

This research project involves full-scale evaluation of the newly developed and marketed ABF secondary treatment process. A primary objective to document the performance and operating characteristics of the system operating under design loading conditions during the coldest months of the year. An additional objective is to document the energy requirements associated with operating the ABF system. Another objective is to determine the performance and operating characteristics of the bio-cell unit and of the short-term aeration unit within the ABF system, to identify the relative activities of each of these two units in sharing the organic load to the system. Other aspects of the evaluation will include determining system stability at

different loading conditions, sludge settling characteristics, sludge wasting requirements, and system operational requirements.

The data collection phase of the research project was selected to include two cold weather operating periods and one warm weather period. Also, three different loading conditions will be evaluated by removing from service portions of the ABF process.

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INSTALLATION OF SULFUR DIOXIDE EQUIPMENT AT BILLINGS WWTP
By Bill F. Fielder, Chief Chemist

(Ed. Note - Low fecal coliform limits and low chlorine limits are often a contradiction. If you meet one limit, you are quite likely to violate the other. By using a method to dechlorinate after superchlorination, it is possible to meet both limits. We attempted find out some day to day operating costs but were unable to do so. Maybe Bill will send us those when he gets off vacation).

The Billings Wastewater Treatment Plant came on line in May, 1976, and for the next 20 months the Plant was unable to meet Environmental Protection Agency discharge limits in both fecal coliform limit and chlorine residual. In January, 1978, the Wastewater Treatment Plant made a plant scale run utilizing superchlorination and dechlorination with Sulfur Dioxide. It was this two-week trial period that showed that this method would enable the Wastewater Treatment Plant to meet the required parameters. On February 16, 1978, a Sulfonator with a 0-500 pound per day flow proportional unit was ordered from Fischer-Porter Instrument Company at a cost of $3,270.00. The Sulfonator and related equipment was delivered on November 6, 1978, and installation began. A plywood, 10-foot by 4-foot structure was erected to house a 2-ton cylinder of Sulfur Dioxide and to protect the Sulfonator from weather. Potable water was connected to the Sulfonator by using 1-inch PVC pipe. Sulfur Dioxide is fed to the effluent of the two chlorine contact basins using 3/4-inch black iron pipe to a diffuser pipe that discharges along the length of the V-notch weir at a depth of 18 inches.

Total cost to the City of Billings for the Sulfonator, ton cylinder enclosure and all related plumbing was less than $5,000.00 including labor. Sulfur Dioxide is purchased locally from S.E.C. Corporation at a cost of $860.00 per cylinder plus $30.00 per month demurrage.

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PRESS RELEASE: MARCH 18, 1979

Carl Lauterjung, Kalispell, Chairman, and Don Willems, Helena, Director, Montana Board of Certification for Water and Wastewater Operators announced the certification of 31 persons as water and wastewater treatment plant operators. Those passing the examination which was given in Missoula, Montana, are:

Class 1: Deanna Anderson, Great Falls; Ron Anderson, Libby; Pat Becker, Conrad; Lloyd Bowen, Lewistown; John Campbell, Polson; Robert Clarke, Columbia Falls; Ralph Dunahoo, Conrad; John Floden, Columbia Falls; Rodney Glidden, Kalispell; Tim Gordy, Havre; Louis Jenkins, Kalispell; Mike Kaleva, Havre; James LaFever, Bigfork; Jack Martin, Havre; Robert Martin, Havre; Keith Nelson, Great Falls; Douglas Pahlke, Great Falls; Douglas Peters, Kalispell; Virgil Phelps, Livingston; Guy Sharp, Missoula; Michael Toavs, Hungry Horse; Roger Zentzis, Whitefish.

Class 2: Kenneth Guinard, Troy; Steven Herndon, Chinook; Dean A. Sloan, Miles City; William Vink, Livingston.

Class 3: Roy Buechler, Joliet; Alvin Crawford, Harlowton; George Prentice, Whitefish; Graham Riley, Missoula; Clara Vannice, Plains.

In order to receive certification, a person must pass an examination indicating proficiency in certain aspects of system operation, chemistry, bacteriology, and hydraulics. This knowledge is necessary to protect the safety of the public and private water supplies and to protect the state waters from pollution. Currently, there are about 1100 certified water and wastewater treatment plant operators in Montana.

The examinations were administered March 28, 1979, in Missoula, Montana. The next examinations are scheduled for December 1, 1979, in four locations: Bozeman, Havre, Miles City, and Missoula. Anyone interested in taking the examination may obtain more information from the Water and Wastewater Operators Board, Department of Health and Environmental Sciences, Helena.

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ANNUAL LABORATORY SCHOOL ANNOUNCED

The Water Quality Bureau and the laboratory sections of the Montana Department of Health and Environmental Sciences will conduct a training conference regarding laboratory methods for the analysis of water and wastewater. This conference, the fourth such training conference offered by the Department in the past three and one-half years, will take place August 13-17, 1979, at the Carroll College laboratory facilities in Helena, Montana. The conference will be open to a limited number of analysts from laboratories throughout the state.

Training will be offered regarding the methods for determination of fecal coliform, BOD_5, TSS, pH and chlorine residual. Lectures and discussions will also explore the topics of laboratory safety, quality control and general problem solving. Participants will perform "hands on" analysis for all parameters as well as attend appropriate lectures and videotape presentations.

Those interested in attending should contact Kevin Keenan (Water Quality Bureau) at 449-2406, Carole Thompson (Microbiology Lab) at 449-2642, or John Hawthorne (Chemistry Lab) at 449-3644. Some financial assistance is available to local governments to offset the travel and lodging costs associated with participation of an analyst at this conference.

EPA TO DELEGATE MAJOR RESPONSIBILITIES OF THE CONSTRUCTION GRANTS PROGRAM TO THE STATE OF MONTANA

By Max Dodson

A final draft of an agreement has been completed by the Water Quality Bureau and the Montana Office of EPA that delegates major responsibilities for the municipal construction grants program from EPA to the State of Montana. It is scheduled to be signed by July 1, 1979. Approximately $21 million per year will be available to the State for funding eligible projects over the next several years. This is the largest environmental program in the state. The delegation agreement represents a commitment by the Federal and State government to provide for a stronger State role in the administration of the program.

In the past, the State had lead responsibility only for 4 of the 16 major delegatable activities involved in the program. In accordance with the agreement, over the next two years the State will assume responsibility for an additional 10 activities. EPA will maintain an oversight role assisting the State when appropriate.

The total manpower requirements for assumption of the program by the State is 12 person years. The State will be recruiting for 6 new positions to bring their total up to 12.

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DEWATERING TO BE DEMONSTRATED AT MISSOULA STP

For several years the wastewater treatment plant at Missoula has had a sludge handling problem. Inability to successfully dewater anaerobically digested sludge results in large volumes of sludge.

To solve this problem, representatives of Envirotech Corporation, from Salt Lake City will install and run the Eimco beltpress for dewatering sludges at the Missoula STP during the week of July 9-13. Experiments will be run on the primary sludge and on the activated sludge after anaerobic digestion. Tests will also be run on filtrate loading and quality from the beltpresses. Mr. Tony Campman from Denver's Envirotech office will also be there. Tests could possibly extend into the week of July 16-20. All interested parties are invited to visit between Wednesday, July 11, and Friday, July 13.

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CONSTRUCTION NEWS

New Construction Projects

Hobson - sewer rehabilitation
Joliet - sewer rehabilitation
Townsend - sewer rehabilitation

Whitefish - aerated lagoon and lift stations
Stevensville - oxidation ditch
Butte-Silver Bow - sludge lagoon and injection
Darby - lagoon expansion
Hardin - oxidation ditch
Forsyth - oxidation ditch
East Havre - collection system

Close to Construction

Sunburst - lagoon construction
Three Forks - lagoon and infiltration basins
Roberts - storage lagoon with spray irrigation
Miles City - oxidation ditch
Ronan - lagoon expansion
Polson - aerated lagoon
Plains - collection system and lagoon with infiltration basins
Corvallis - collection system and lagoons with infiltration basins
Broadus - lagoon expansion
Livingston - rotating biological disk treatment plant
Big Sky - lift station for irrigation system

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AUTOMATED DRINKING WATER COMPLIANCE CHECKING

By John Jarvie

The Federal Safe Drinking Water Act of 1974 provides for protection of public health by requiring public water supplies to meet minimum water quality standards. The Office of Drinking Water of the U.S. Environmental Protection Agency (EPA) is responsible for implementing the Act. However, Montana, as well as most other states, has accepted the responsibility for monitoring drinking water quality and enforcing the Act.

In order to help the states carry out their monitoring and enforcement functions, EPA developed a computer system called the Model State Information System (MSIS). MSIS is a set of computer programs which each state can take and use on its own computer. The Montana Water Quality Bureau of the Department of Health and Environmental Sciences has entered these programs into the State's centralized IBM 370 computer in Helena.

MSIS creates computer files from information entered into the computer. The act of entering data into the computer is much like typing on a typewriter except the machine displays what has been typed on a small screen and stores the lines for entry into the computer. Each piece of information must be typed in a specific location on a specific line.

Initially, computer files are created that contain information about each public water supply in Montana and about Federal and State drinking water quality regulations. These regulations tell how often water samples should be submitted and the acceptable concentrations of various chemicals. Then, laboratory analysis results are periodically entered into the computer along with a number that identifies to which water supply they apply.

About once a month a computer run is made to check compliance of the water supplies with the regulations. This involves several steps. First, the analysis result file is used by an MSIS computer program to determine which public water supplies have submitted water samples and the lab results. Information from the public water supply file is used to determine the kind of supply and which regulations to use for each of the water supplies. Then, with the appropriate regulations selected, MSIS compares the lab results with the regulations. Also, MSIS checks to make sure the required number of samples have been submitted. Any violations are printed on a computer listing for use by the Water Quality Bureau.

Most states do not have MSIS fully operational yet and some states are experiencing minor problems with it. Some of these problems have been fixed and others are still being worked on. Montana hopes to begin using MSIS to check compliance in the near future. We are currently working on creating and correcting some of the computer files needed for a compliance run. Once operational, MSIS should help perform compliance checking faster and more thoroughly.

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ANNUAL SCHOLARSHIP GIVEN

Keith Nelson received the annual Montana section AWWA-MWPCA scholarship award at Northern Montana College for 1979. He received an AA degree in Environmental Health-Water and Wastewater Technology from Northern Montana College recently.

BILLINGS SEMINAR A SUCCESS
By Tim Hunter

The Water Quality Bureau's Oxidation Ditch Seminar was held at the Northern Hotel in Billings in May. We have received many favorable comments about the seminar. There were 54 attendees from all over Montana and several neighboring states. The information presented was valuable to all.

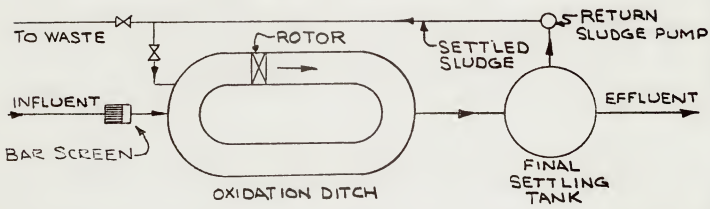
The oxidation ditch is an extended aeration form of the conventional activated sludge process. The aeration basin at the oxidation ditch plant has a long and narrow configuration, hence the name "ditch". Generally, the ditch is constructed in an oval. The ditch appears to be an excellent form of wastewater treatment. Some of the positive aspects of this form of treatment which were brought out at the seminar are:

1. Consistently good effluent quality
2. Ease of operation and maintenance
3. Stability
4. Minimal sludge production

Some problems with oxidation ditch plants which were discussed at the seminar included:

1. Inadequate sludge handling capacity
2. Ice and cold weather related problems
3. Wave action problems

At the present time in Montana we have two oxidation ditches in operation; one at Colstrip and one in Poplar. Several other communities are constructing ditches or are planning to build them in the future. These include Stevensville, Forsyth, Miles City, Hardin, Hamilton, Libby, and Boulder.



OXIDATION DITCH PLANT
LINE DIAGRAM

OPERATOR EMPLOYMENT SERVICE

We started an operator employment service last year to help operators get in touch with employers and vice versa. Right now, we have operators and no employers. If you would like to make use of this service, please contact Rosemary Fossum at (406) 449-2691.

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CROSS-CONNECTION CONTROL SEMINARS

The Water Quality Bureau, in conjunction with the Clapper Company of Billings and Watts Regulator Company of Boston, presented seminars on Cross-Connection Control at Billings and Great Falls in April. Howard Hendrickson of Watts Regulator Company presented the four-hour programs to approximately 70 people. Mr. Hendrickson's experience and expertise in the field made the seminars very informative and interesting.

The Water Quality Bureau has a cross connection seminar which we will be glad to make available to a town or several towns. If you would like a cross-connection school presented in your area, please contact us.

Also, we will soon be starting a training program on how to test and repair Backflow Prevention Devices. We hope to train and certify people to test these devices.

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RIDIN' THE BIG SKY
By Chuck Harper

(Herein discussed are people, places, events, fishing, and other pressing issues in the water-wastewater business).

Billy Glen of Chinook is back to jerking steers after suffering a heart attack in December. Clean catches to you Bill, double hock 'em.

I heard Henry Johnson of Pablo bought an air rotary drilling rig. I beat Henry out of dinner one evening last fall and Henry complained bitterly that if it cost 20 cents to go around the work, he couldn't get to Kalispell. Really, Henry. . .

Saw the premiere winemaker of the highline, Dick Voorhies of Shelby, at the cross-connection seminar in Great Falls. He slipped me a bottle of chokecherry and a bottle of huckleberry. Didn't think anything could be better than last year's but sure believe it was. Thanks, Dick.

Dan Fraser blew into the Water Quality Bureau office with a wild tale about Jim Coffman, head man at Chester, being down in a ditch working in the mud.

Of course, I dismissed such a tale as Fraser may have been suffering from a fever contracted in Shelby. I'll see Bob Aitken one of these days and find out what really happened.

Mike Holzwarth was recently promoted to crew foreman at Colstrip. Understand John Blath took over oxidation ditch duties. I hope this is right fellas because I got it secondhand. Anyway, congratulations!

From the far northeast comes word that Howard Smith, Poplar's city superintendent and part-time oxidation ditch operator, has hired a new operator.

Anyone having information on current salmon fly hatches, call Chuck Harper at 449-2406. Leave message with last know position and direction headed.

Saw Dave George in Glasgow and just missed Frank Hopwood which was really too bad because I'm sure Frank would have sprung for a beer. Next time maybe.

We have succeeded in changing the water school date this year. It will be in the first part of October before hunting season and bad weather (?). So, for everyone who used those reasons as an excuse not to come, see you there in October.

Anyone needing an extra hand on a pack trip to wilderness fishing and has an extra saddlehorse, please call Chuck at 449-2406. Leave message.

While in a Great Falls grocery store one morning, I ran into one of the Jones girls - Charlotte. Charlotte is lab tech and chief counselor at the Great Falls water plant. She was buying doughnuts but didn't invite me up.

Speaking of Great Falls, George Strain promised me an article for Big Sky Clearwater. Where is it George? And, while we are on the subject, how about some help from the rest of you operators. A short article, a phone call, anything for the paper. Help!

P.S. - If you liked this column, please send money and fishing tips; mostly money.

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CERTIFICATION CORNER

1. Express 45 psi as feet of pressure head.

2. What horsepower would be required to pump 55 gpm against a total head of 125 feet? The efficiency of the pump is 70 percent and the efficiency of the motor is 85 percent.

3. 1500 lbs of alum are used in a flow of 10,500 gpm. What is the dosage in mg/l?

4. When backwashing a sand filter, water rises through the filter at a rate of 14 inches in 20 seconds. If the filter measures 20 X 25 feet,

how many gal of water are used if the filter is backwashed for 7 minutes?

5. How many pounds of suspended solids per day are removed at a sewage treatment plant which has an influent SS of 260 mg/1, an effluent SS of 20 mg/1, and a flow of 0.75 MG/day?

Answers

1. 2.31 ft of water produces 1 psi, therefore, $45 \cancel{psi} \times \frac{2.31 \text{ ft}}{\cancel{psi}} = 103.95$ ft

2. horsepower $= \frac{\text{gpm X head (expressed in ft)}}{3960 \text{ X total efficiency (motor eff X pump eff)}}$

$= \frac{55 \text{ X } 125}{3960 \text{ X } .7 \text{ X } .85}$

$= 2.92$ or 3 hp

3. first, change gal/min to million gal/day

$\frac{10500 \text{ gal}}{\cancel{\text{min}}} \times \frac{1440 \cancel{\text{min}}}{\text{day}} = 15{,}120{,}000$ gal or 15.12 MG

use the formula mg/1 (dosage) $= \frac{\text{pounds}}{\text{million gal X } 8.34}$

$= \frac{1500}{15.12 \text{ X } 8.34}$

$= 11.9$ mg/1

4. 14 inches in 20 sec = 42"/min or $\frac{42''}{12''/\text{ft}} = 3.5$ ft/min

every minute a volume of water 20' X 25' X 3.5' passed through the filter
20' X 25' X 3.5' = 1750 $\cancel{\text{cu ft}} \times \frac{7.5 \text{ gal}}{\cancel{\text{cu ft}}} = \frac{13125 \text{ gal}}{\text{min}}$

$\frac{13125 \text{ gal}}{\cancel{\text{min}}} \times 7 \cancel{\text{min}} = 91{,}875$ gal used for backwash

5. Inf - eff = mg/1 SS removed
260 mg/1 - 20 mg/1 = 240 mg/1 SS removed

To solve for pounds = mg/1 X MG X 8.34
= 240 X .75 X 8.34
= 1501 lbs of SS/day

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Environmental Sciences
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